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Bacon et al.

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(54) **SCISSOR-TYPE LIFT ASSEMBLY**

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(51) **Int. Cl.**

B66F 7/06	(2006.01)
B66F 3/22	(2006.01)
B66F 7/28	(2006.01)
B66F 3/46	(2006.01)

(52) **U.S. Cl.**

CPC ***B66F 7/0658*** (2013.01); ***B66F 3/46*** (2013.01); *B66F 3/22* (2013.01); *B66F 7/28* (2013.01)

(58) **Field of Classification Search**

CPC B66F 7/0658; B66F 3/46; B66F 3/22; B66F 7/28

USPC 248/155.2

See application file for complete search history.

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(57) **ABSTRACT**

The subject invention includes a lift system including a first scissor-type lift assembly and a second scissor-type lift assembly spaced from the first scissor-type lift assembly. The first scissor-type lift assembly includes a first base and a first platform coupled to the first base for movement between elevated and lowered states. The first scissor-type lift assembly includes a first motor operatively mounted to the first base. The second scissor-type lift assembly includes a second base and a second platform coupled to the second base for movement between elevated and lowered states. The second scissor-type lift assembly includes a second motor operatively mounted to the second base. The first and second motors move the first and second platforms between the elevated and lowered states. The lift system includes a controller in communication with the first and second scissor-type lift assemblies to synchronize operation of the first and second motors.

15 Claims, 13 Drawing Sheets

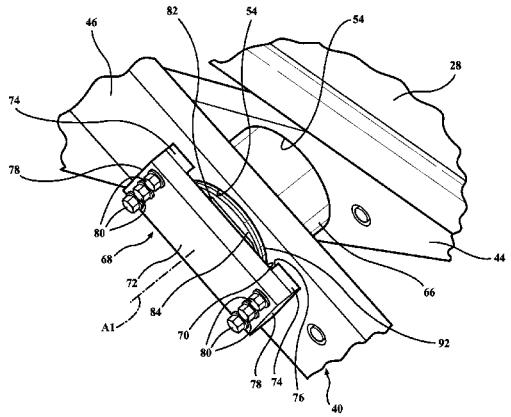

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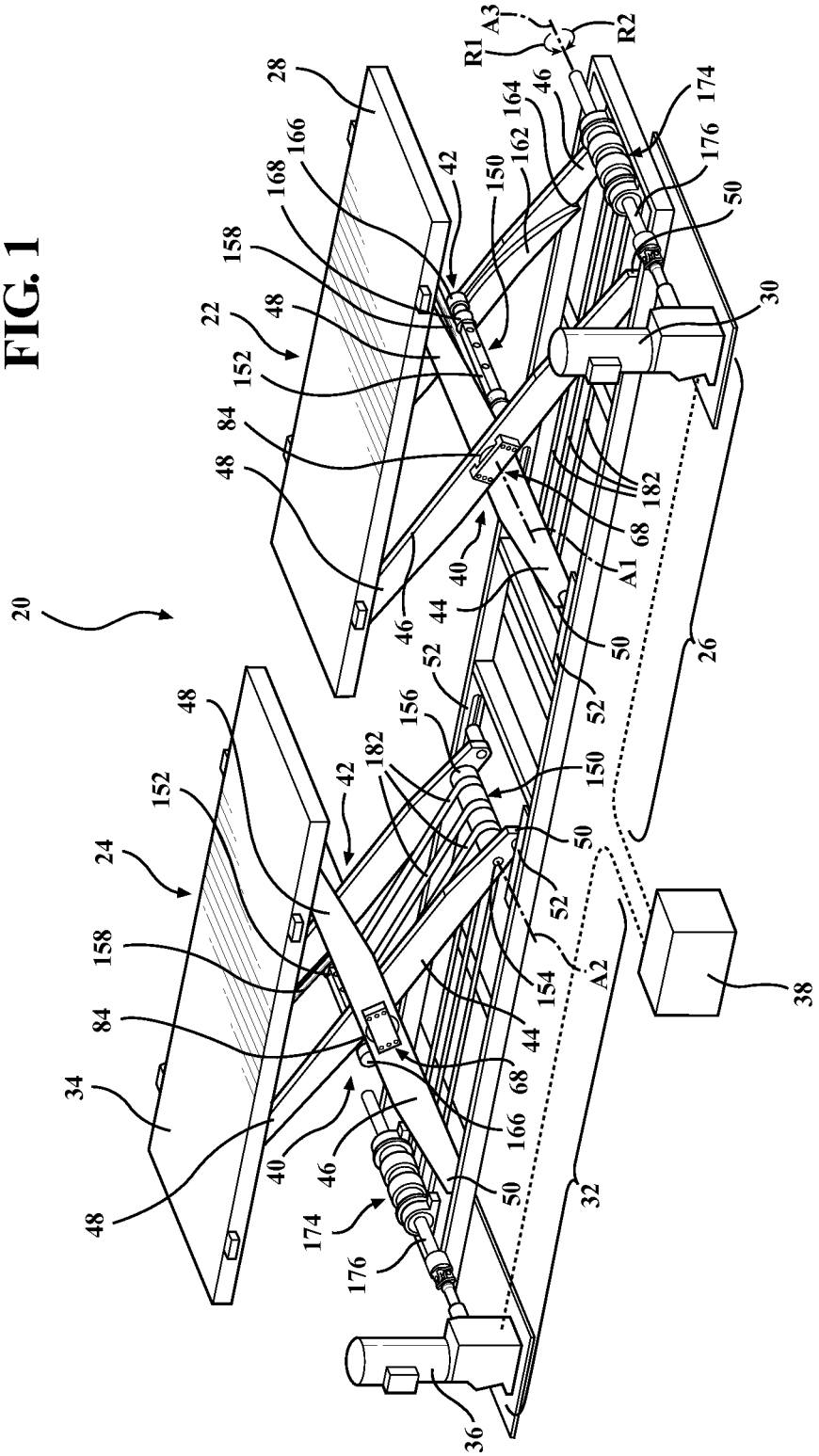
FIG. 1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A3
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R2

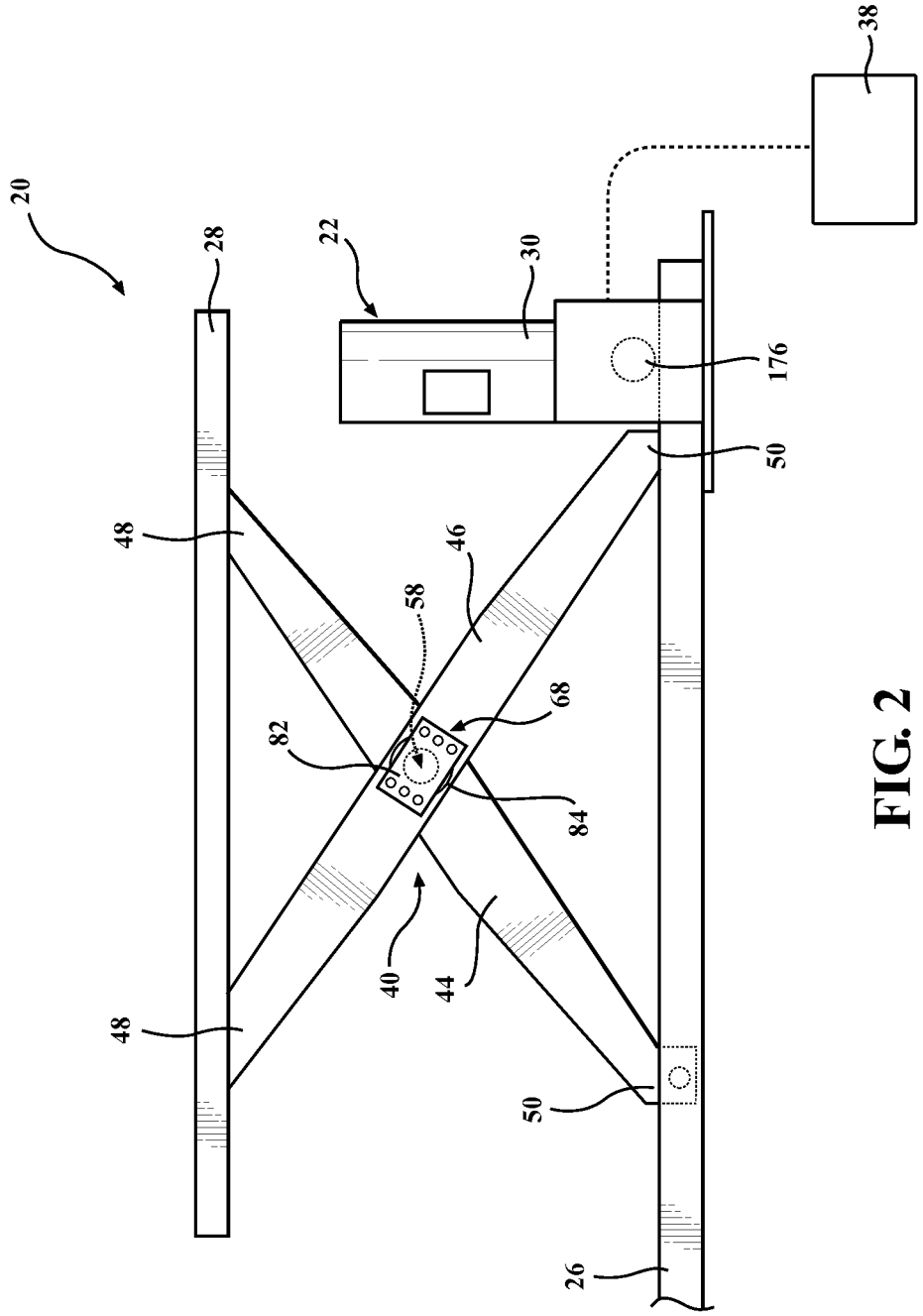
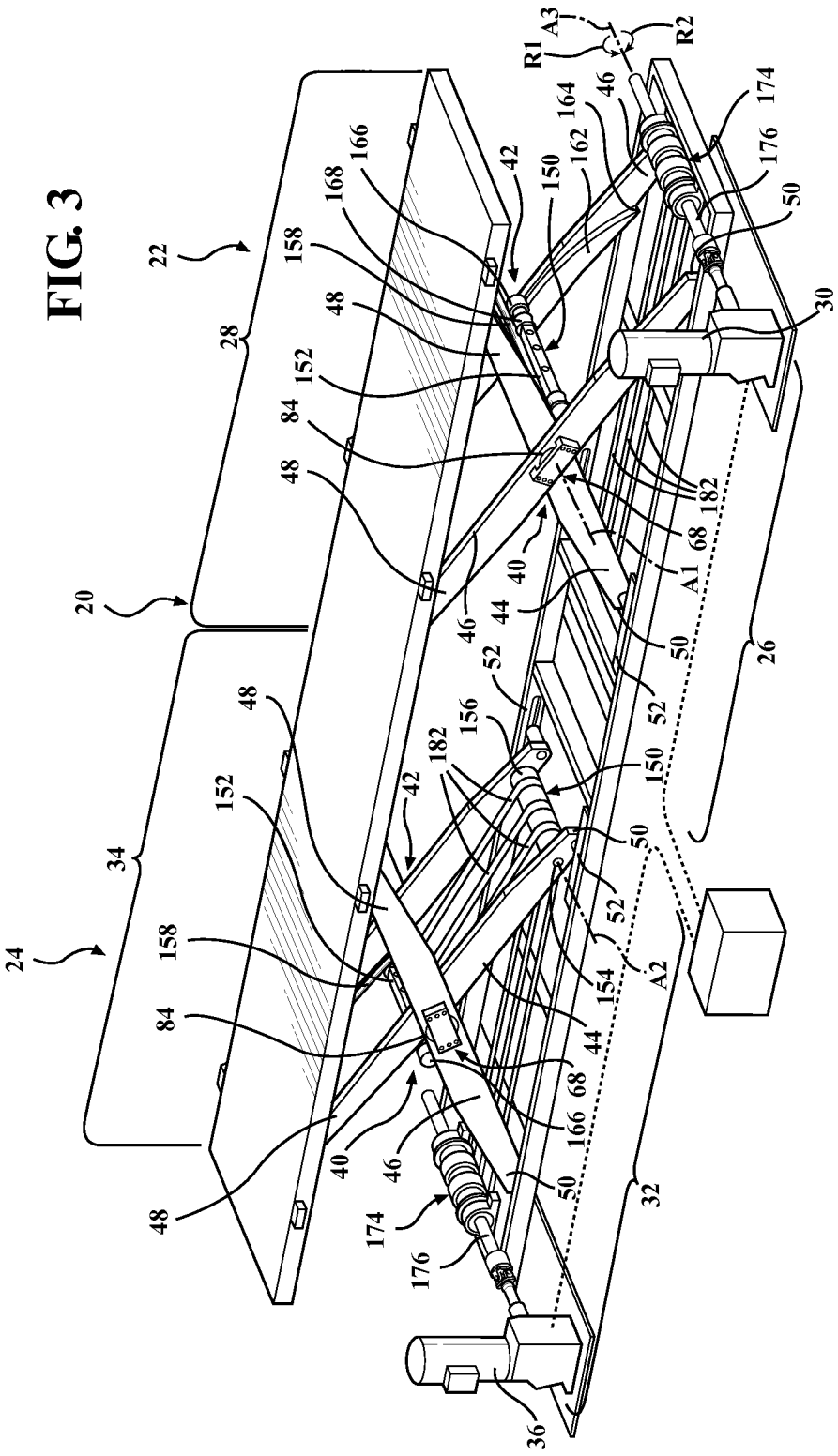


FIG. 2

FIG. 3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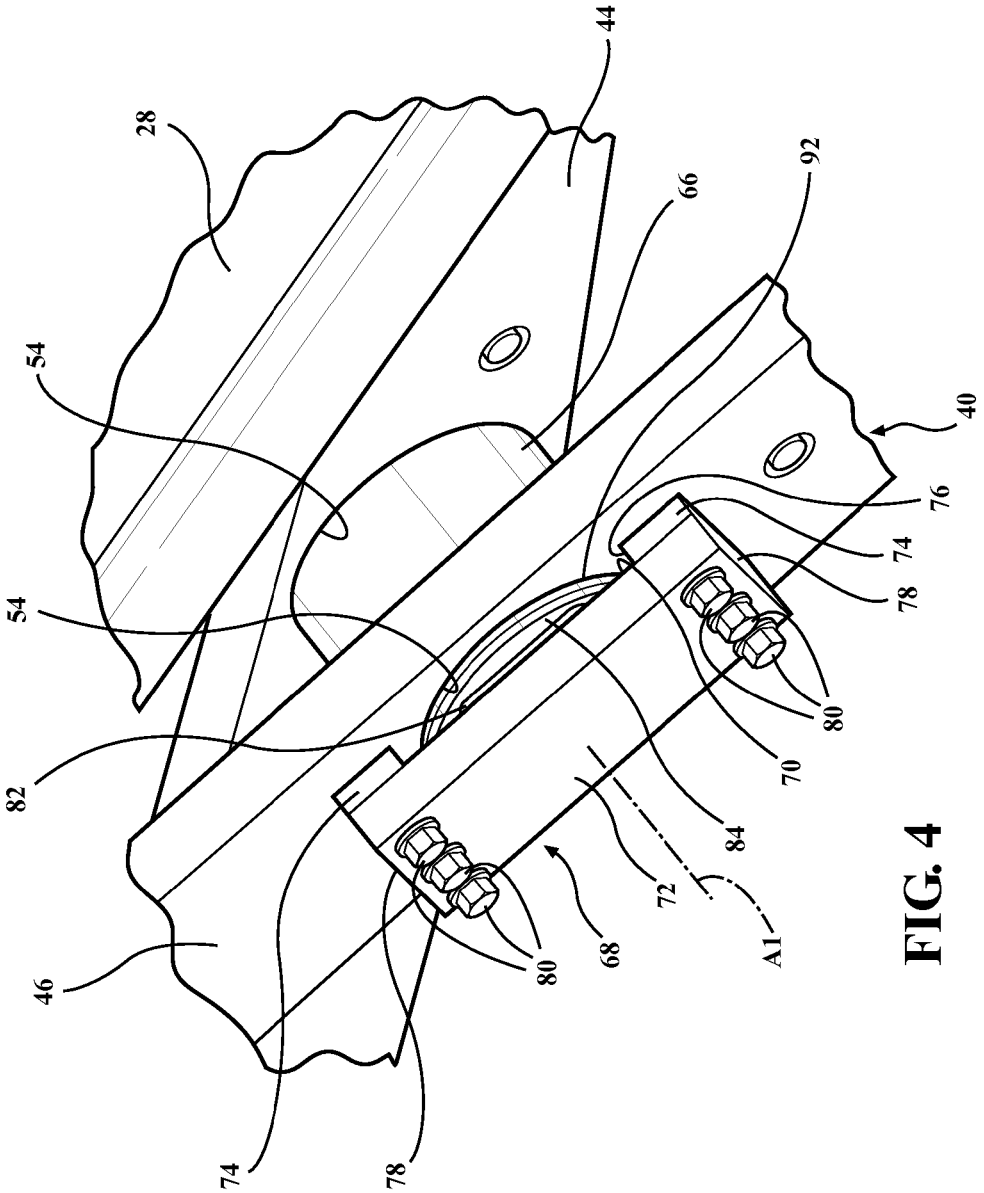

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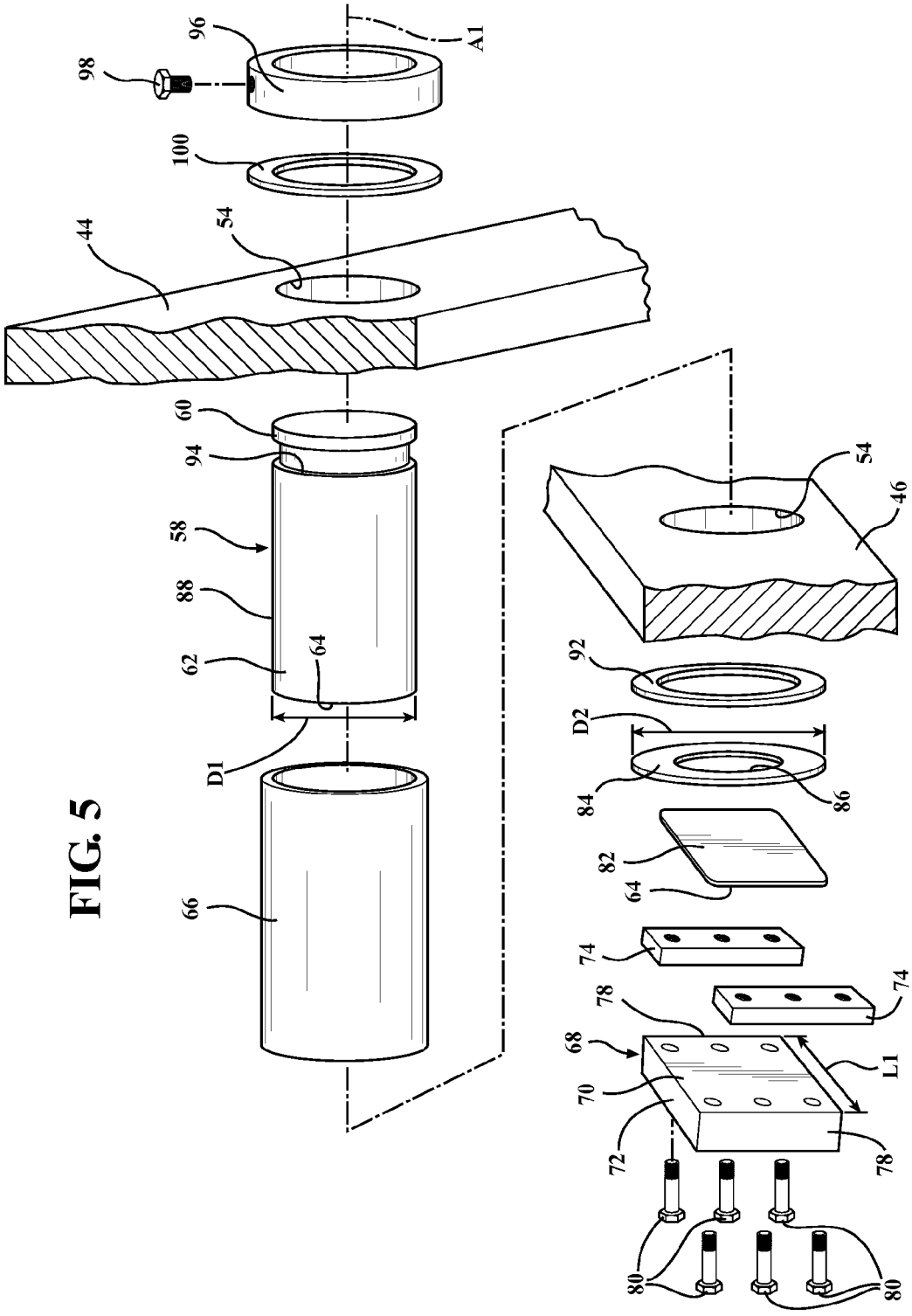
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FIG. 5

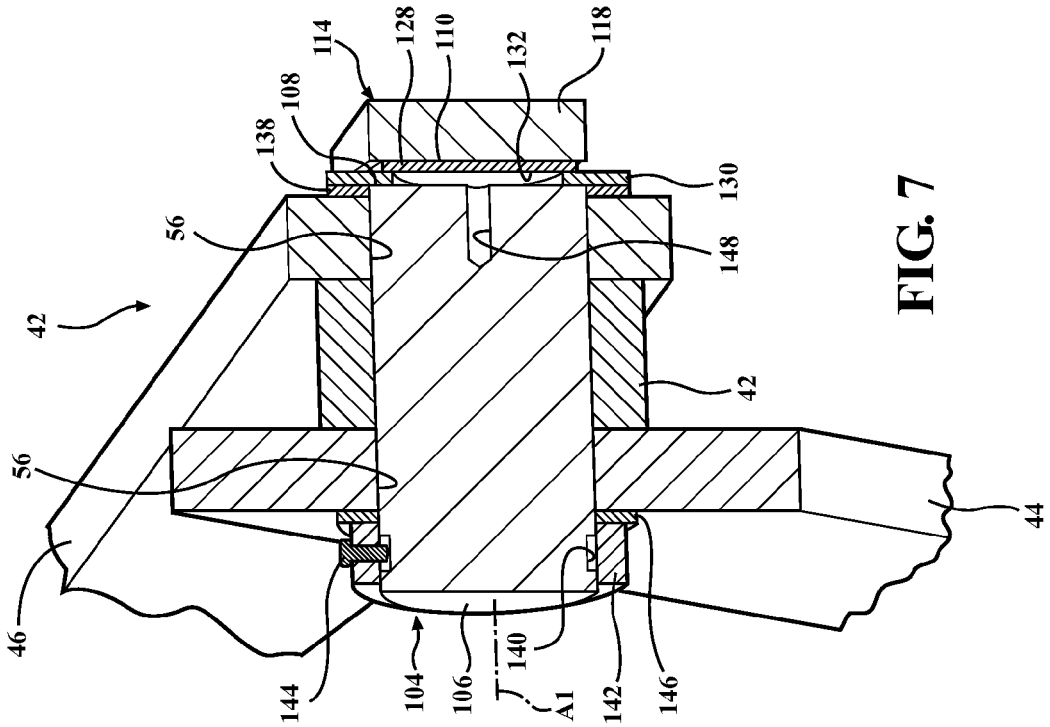
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FIG. 7

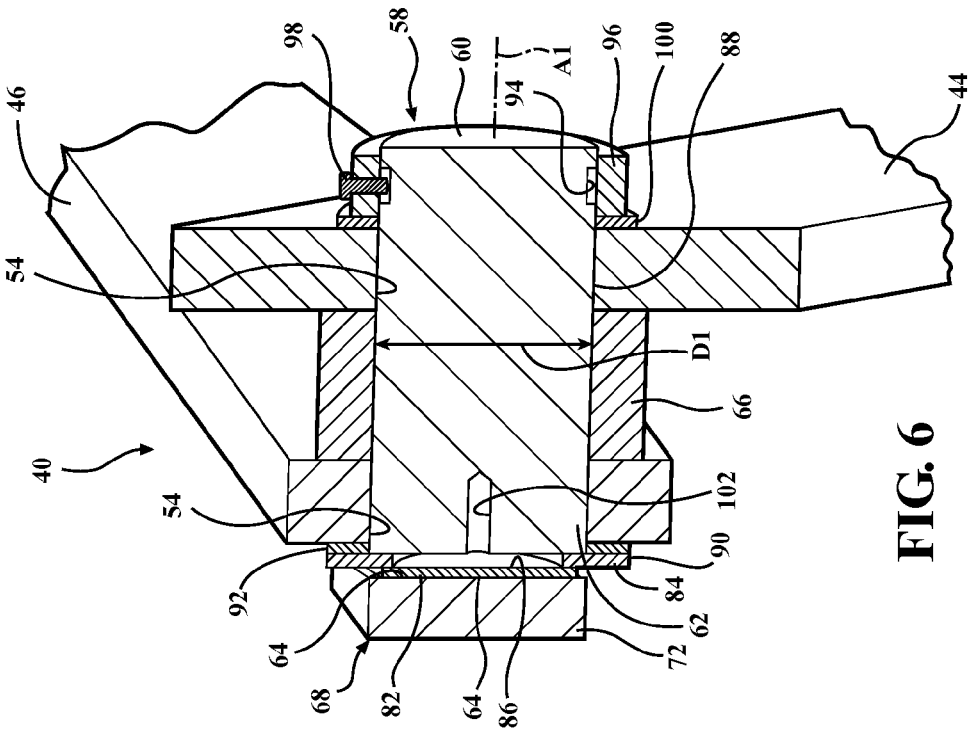
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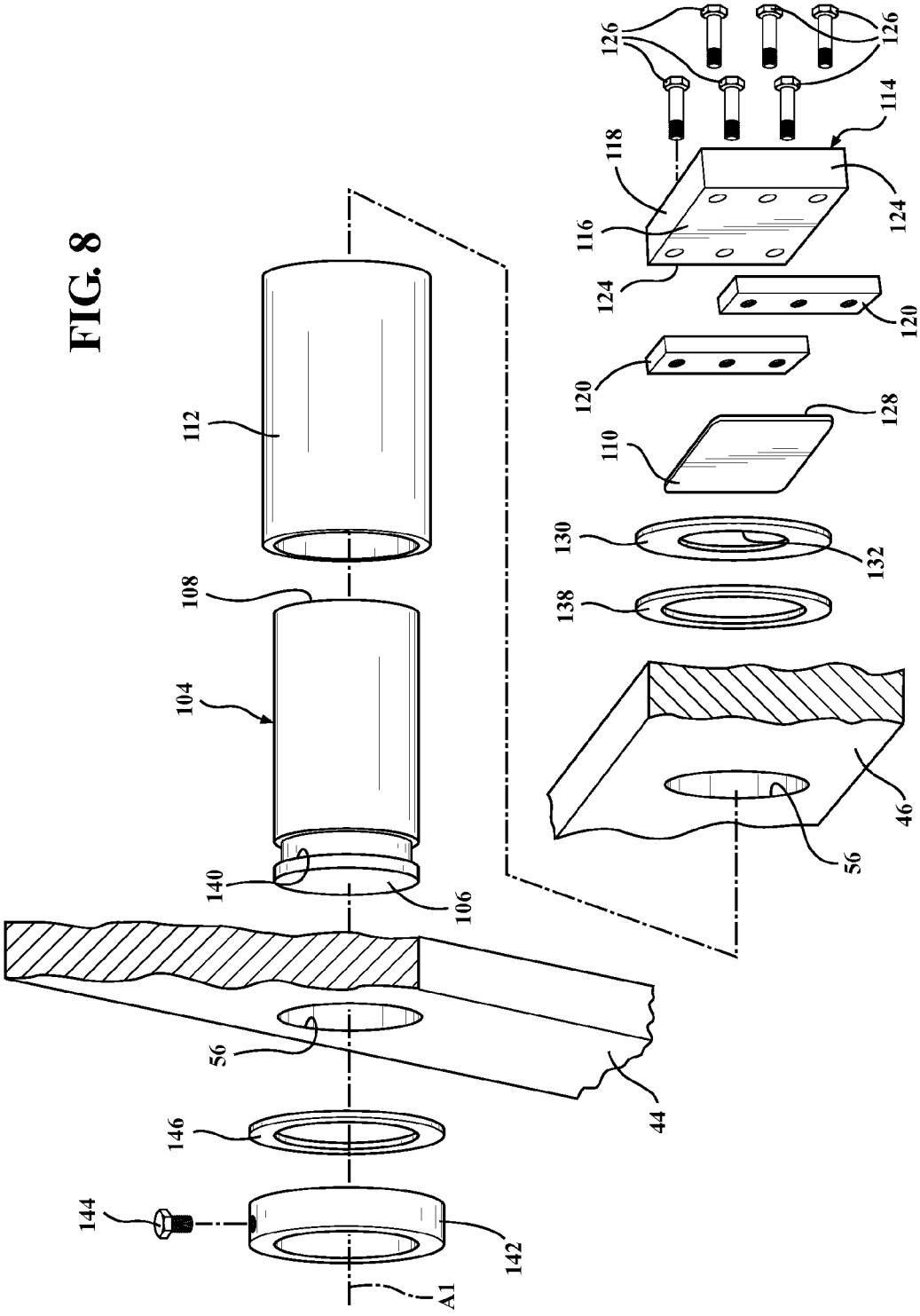
FIG. 6

FIG. 8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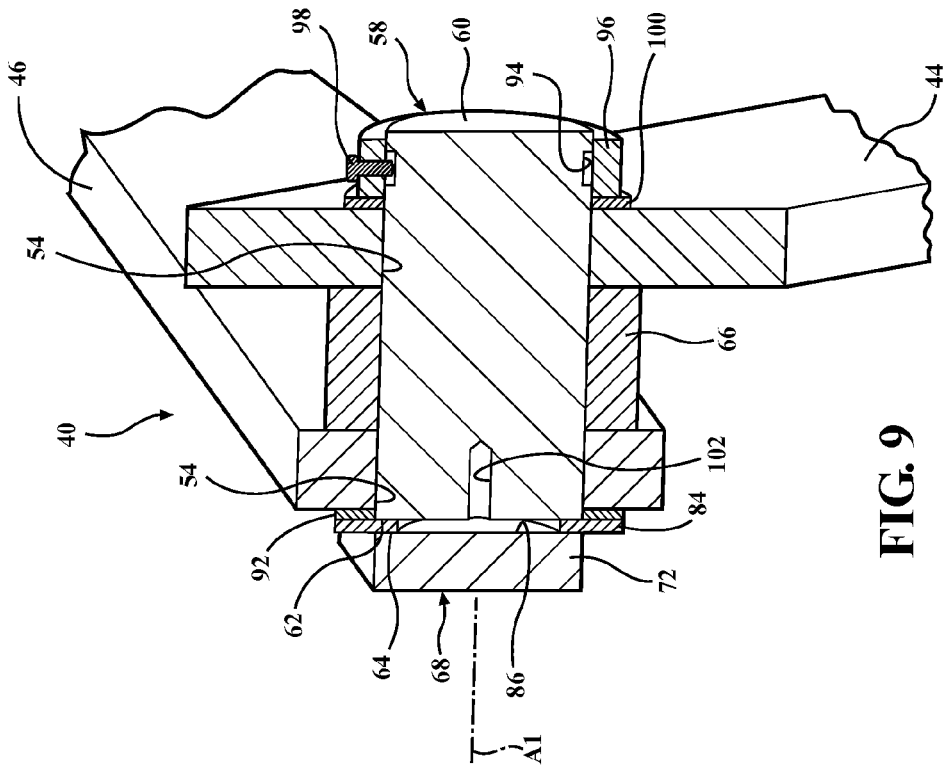

FIG. 9

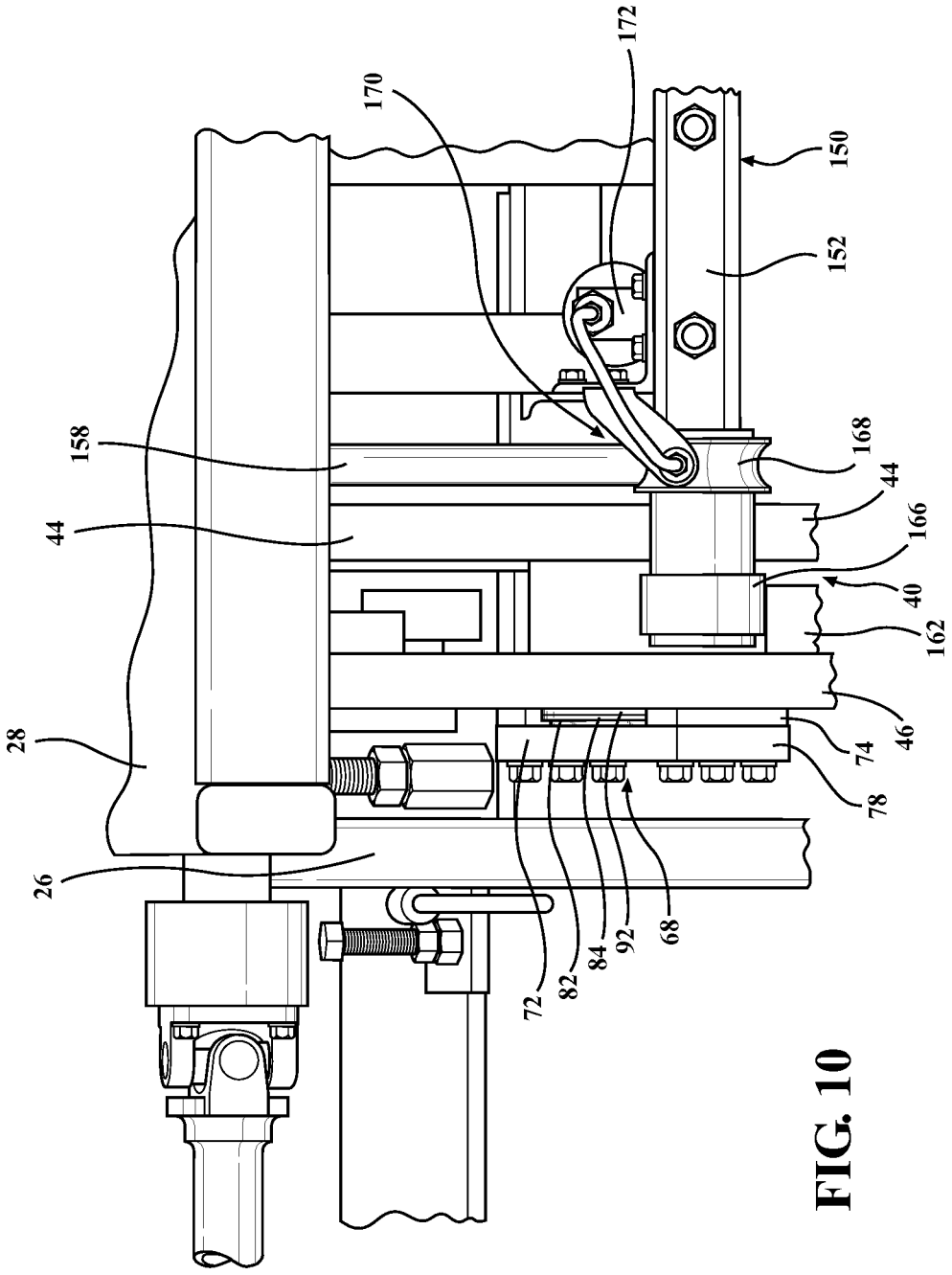
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FIG. 10

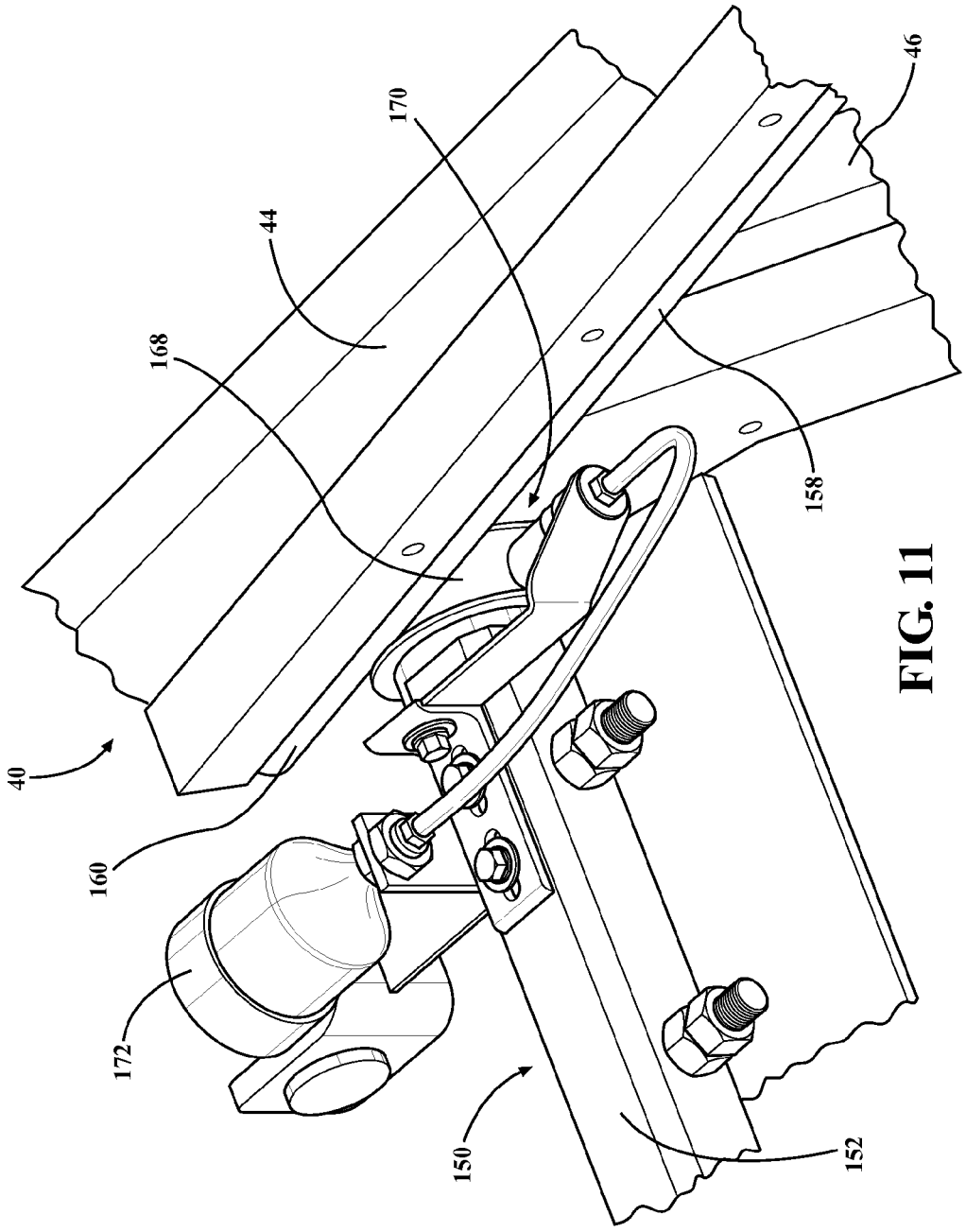
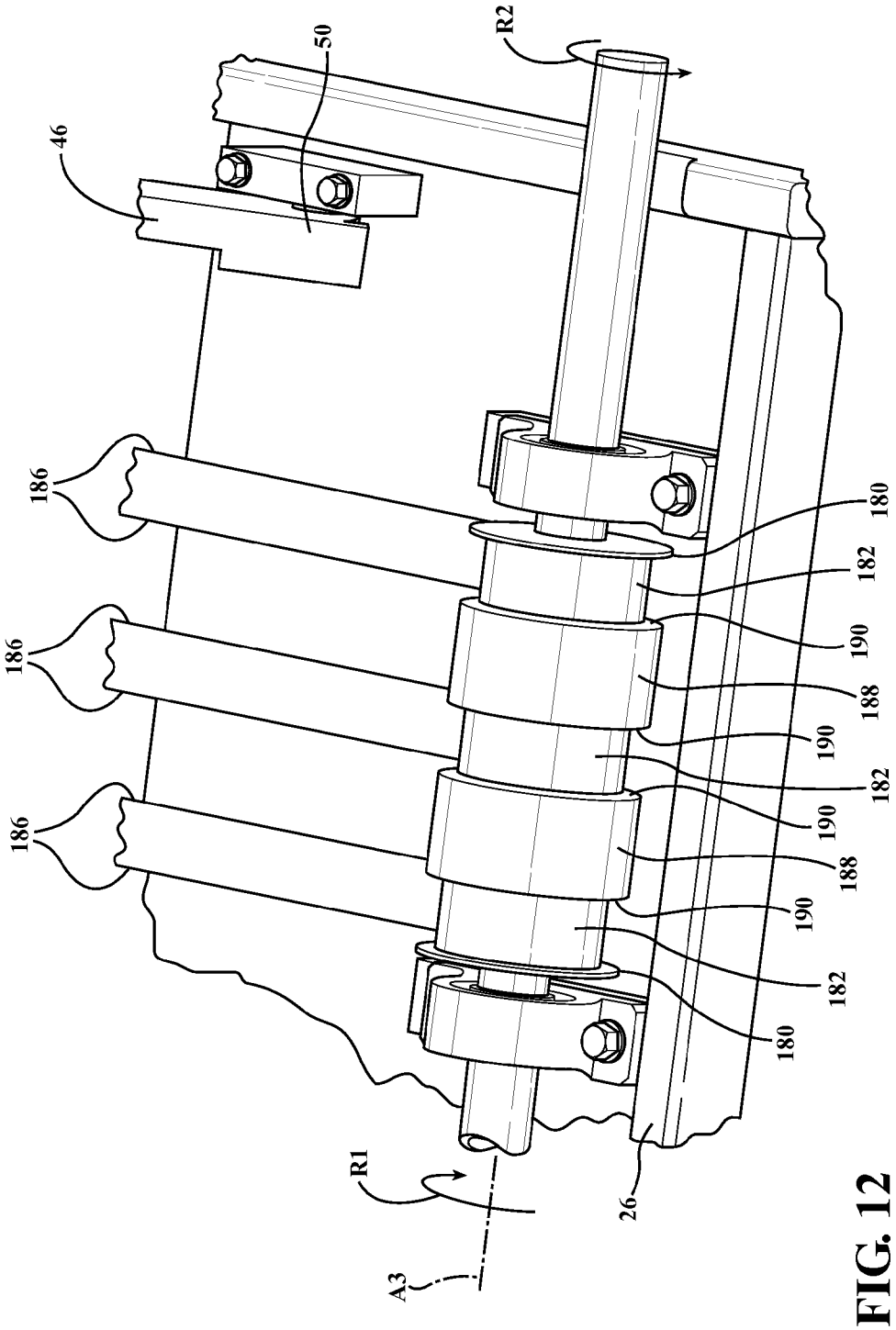


FIG. 11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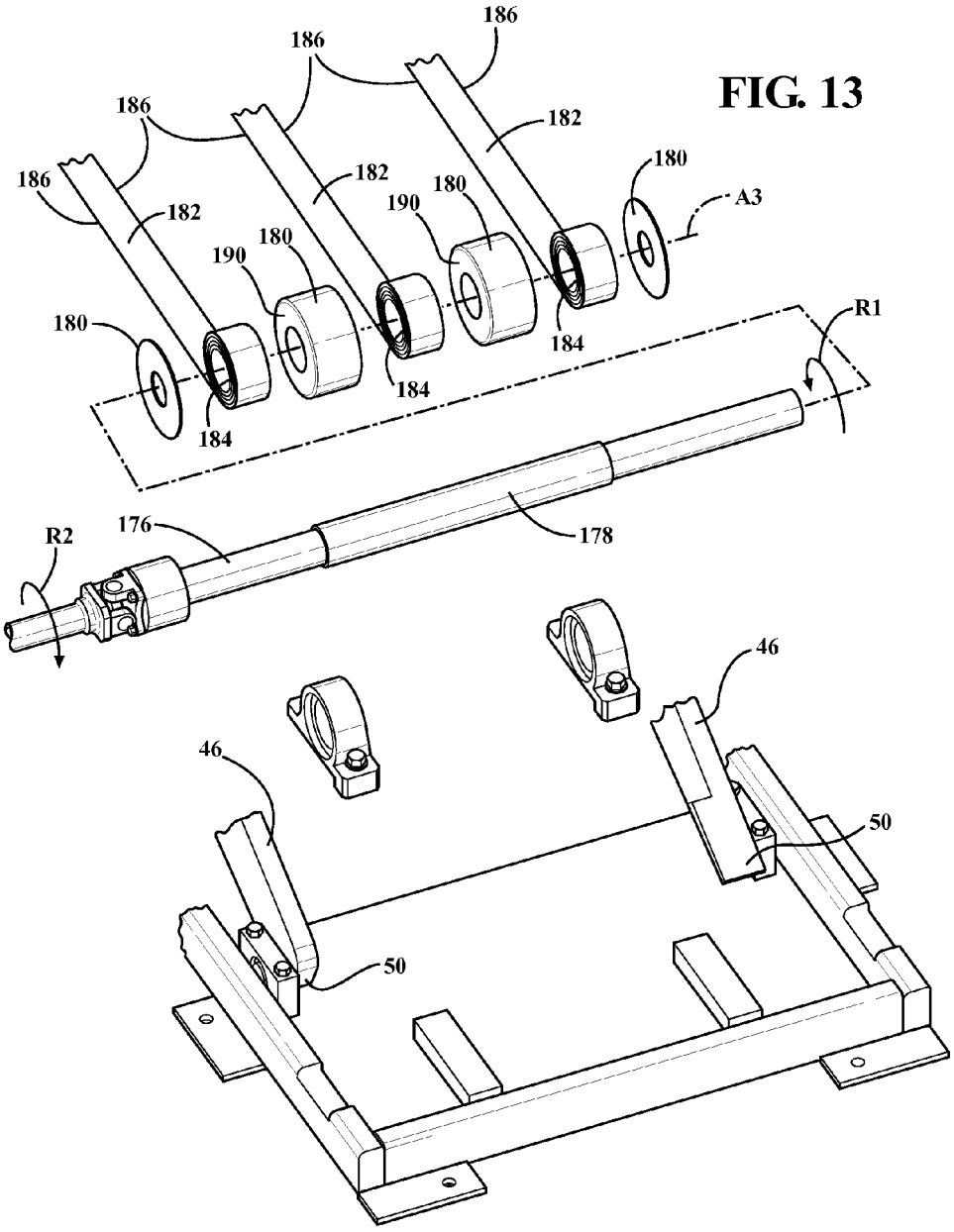
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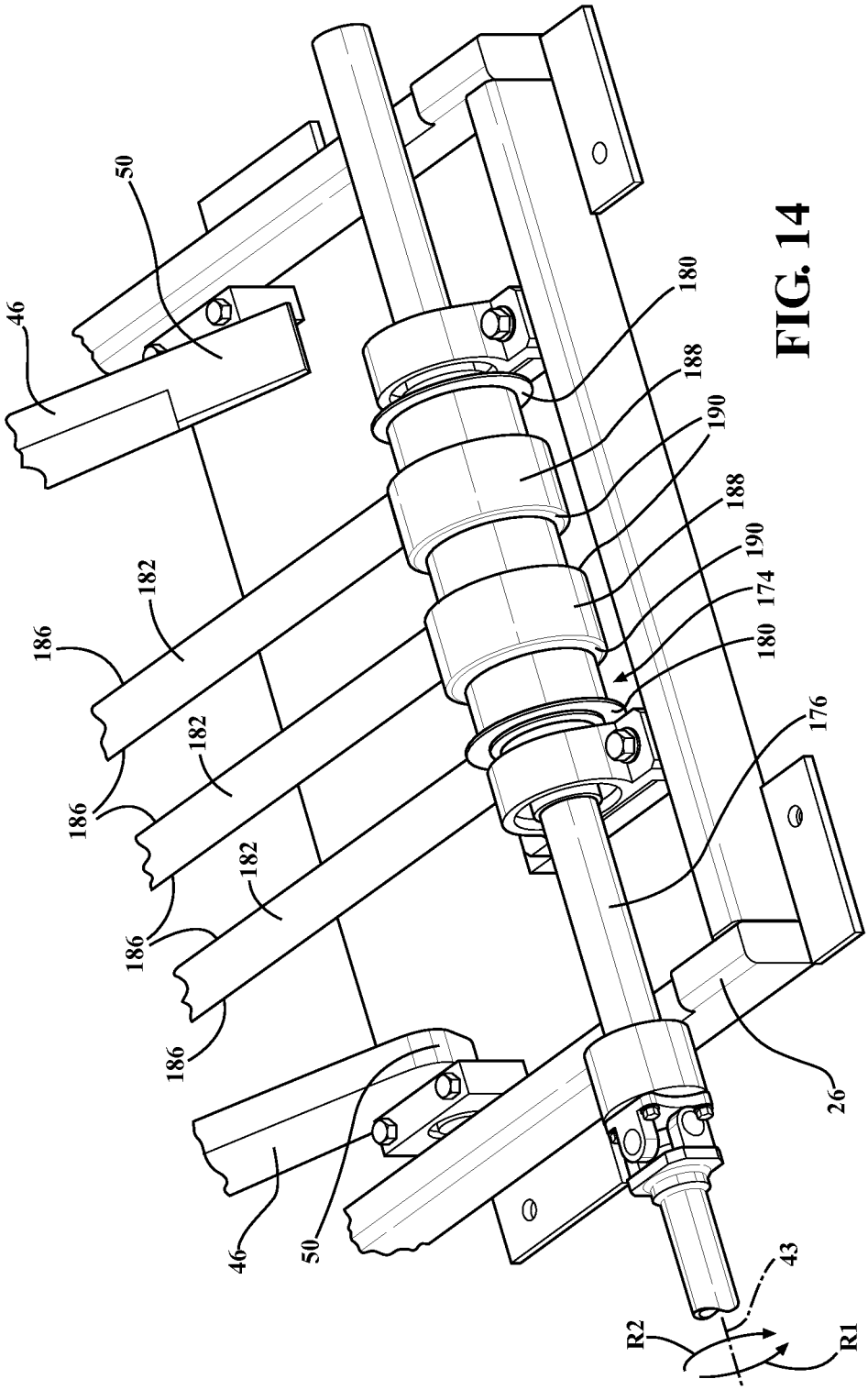
FIG. 13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R2
R1

FIG. 14

SCISSOR-TYPE LIFT ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to lift assemblies.

2. Description of Related Art

Transportation systems such as lift systems are well known for moving items or people between two vertically differing locations. Transportation systems such as conveyor assemblies are well known for moving items or people between two horizontally differing locations. It is also known to move the platform or carriage of these systems through a belt-driven apparatus.

One well-known and useful type of lift system is the scissor-type lift assembly, which includes a pair of scissor arms coupled to a platform with the pair of scissor arms pivoting as the platform is moved between an elevated state and a lowered state. Such lift systems are commonly driven through hydraulic cylinders connected to a single hydraulic pump.

Some lift systems, including the pair of scissor arms, can be susceptible to wear due to flexing and undesired movement of the pair of scissors during operation. Each of the pair of scissor arms pivot about a shaft as a platform moves between elevated and lowered states. The shaft can flex or move as the pair scissor arms pivot, which can lead to wear to the shaft and the pair of scissor arms.

SUMMARY OF THE INVENTION AND ADVANTAGES

The subject invention includes a lift system including a first scissor-type lift assembly and a second scissor-type lift assembly. The first scissor-type lift assembly includes a first base and a first platform coupled to the first base for movement between elevated and lowered states in which the first platform and the first base are distant and proximate, respectively. The first scissor-type lift assembly includes a first and second pair of scissor arms each having upper and lower ends respectively coupled to each of the first platform and the first base. The first and second pair of scissor arms are connected to each other intermediate their respective upper and lower ends about a first pivot axis for pivoting relative to each other during the movement of the first platform between the elevated and lowered states. The first scissor-type lift assembly includes a first guide arrangement mounted to the first and second pair of scissor arms to define a first path with the first guide arrangement being movable with the first and second pair of scissor arms during the movement of the first platform. The first scissor-type lift assembly includes a first spool coupled to the first base and defining a first spool axis. The first scissor-type lift assembly includes a first belt routed through the first path of the first guide arrangement with the first belt having a primary end engaged with the first spool onto which the first belt is wound and from which the first belt is unwound. The first scissor-type lift assembly includes a first motor mounted to the first base and operatively coupled to the first spool to wind and unwind the first belt through the first path to move the first and second pair of scissor arms and move the first platform between the elevated and lowered states.

The second scissor-type lift assembly includes a second base and a second platform coupled to the second base for movement between elevated and lowered states in which the second platform and the second base are distant and proximate, respectively. The second scissor-type lift assembly includes a third and fourth pair of scissor arms each having upper and lower ends respectively coupled to each of the second platform and the second base. The third and fourth pair of scissor arms connected to each other intermediate their respective upper and lower ends about a second pivot axis for pivoting relative to each other during the movement of the second platform between the elevated and lowered states. The second scissor-type lift assembly includes a second guide arrangement mounted to the third and fourth pair of scissor arms independent from the first guide arrangement to define a second path with the second guide arrangement being movable with the third and fourth pair of scissor arms during the movement of the second platform. The second scissor-type lift assembly includes a second spool coupled to the second base and defining a second spool axis. The second scissor-type lift assembly includes a second belt routed through the second path defined by the second guide arrangement with the second belt spaced from the first belt and having a primary end engaged with the second spool onto which the second belt is wound and from which the second belt is unwound. The second scissor-type lift assembly includes a second motor mounted to the second base and operatively coupled to the second spool to wind and unwind the second belt independently from the first motor through the second path to move the third and fourth pair of scissor arms and move the second platform between the elevated and lowered states.

The lift system includes a controller in communication with the first and second motors to synchronize operation of the first and second motors for moving the first and second platforms between the associated elevated and lowered states in synchronization.

The first scissor-type lift assembly includes a first shaft disposed along the first pivot axis and the second scissor-type lift assembly includes a first shaft disposed along the second pivot axis. The first shaft having a first end and a second end spaced from the first end along the first pivot axis with the first and third pair of scissor arms pivotably disposed about the first shaft. The first and second ends extending from the first and third pair of scissor arms with the second end terminating at a first shaft face. Both of the first and second scissor-type lift assemblies of the lift system include a first retention device coupled to the first end of the first shaft with the first retention device engaging one scissor arm of the first and third pair of scissor arms.

The first scissor-type lift assembly includes a second shaft disposed along the first pivot axis and the second scissor-type lift assembly includes a second shaft disposed along the second pivot axis. The second shaft having a third end and a fourth end spaced from the third end along the second pivot axis with the second and fourth pair of scissor arms pivotably disposed about the second shaft. The third and fourth ends extending from the second and fourth pair of scissor arms with the fourth end terminating at a second shaft face.

The first and second scissor-type lift assemblies of the lift system include a second retention device coupled to the third end of the second shaft with the second retention device engaging one of the scissor arms of the second and fourth pair of scissor arms. Both of the first and second scissor-type lift assemblies of the lift system include a first brace fixed to another one of the first and third pair of scissor arms with the first brace abutting the first shaft face of the first shaft to maintain alignment of the first shaft along the first and second pivot axes for reducing wear between the first and third pivot axes and the first and third pair of scissor arms. Both of the first and second scissor-type lift assemblies of the lift system include a second brace fixed to another one of the second and fourth pair of scissor arms with the second brace abutting the second shaft face of the second shaft to maintain alignment of

the second shaft along the first and second pivot axes for reducing wear between the first and second pivot axes and the second and fourth pair of scissor arms.

Advantageously, since the first motor of the first scissor-type lift assembly and the second motor of the second scissor-type lift assembly are in communication with and controlled by the controller, the lift system may be precisely controlled. Further, the force is divided between the first and second motors to allow a reduction in motor size. Additionally, since the first and second braces abut the first and second shafts to maintain alignment of the first and second shafts along the first and second pivot axes, wear to the shafts and the pairs of scissor arms is reduced as the pair of scissor arms pivot.

BRIEF DESCRIPTION OF THE DRAWINGS

Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings.

FIG. **1** is a perspective view of a lift system having a first scissor-type lift assembly and a second scissor-type lift assembly with the lift system shown in an elevated state.

FIG. **2** is a fragmented side view of the first scissor-type lift assembly of the lift system shown in the elevated state.

FIG. **3** is a perspective view of an alternative lift system having an interconnected platform with the lift system shown in the elevated state.

FIG. **4** is a fragmented perspective view of a first brace coupled to a first pair of scissor arms at a first pivot axis.

FIG. **5** is an exploded perspective view of the first brace, the first pair of scissor arms, a first shaft, and a first retention device.

FIG. **6** is a fragmented cross-sectional perspective view of the first brace, the first pair of scissor arms, the first shaft, and the first retention device.

FIG. **7** is a fragmented cross-sectional perspective view of a second brace, a second pair of scissor arms, a second shaft, and a second retention device.

FIG. **8** is an exploded perspective view of the second brace, the second pair of scissor arms, the second shaft, and the second retention device.

FIG. **9** is a fragmented cross-sectional perspective view of an alternative arrangement of the first brace, the first pair of scissor arms, and the first shaft.

FIG. **10** is a fragmented perspective view of a first lubrication feature coupled to a first engagement shaft.

FIG. **11** another fragmented perspective view of the first lubrication feature coupled to the first engagement shaft.

FIG. **12** is a fragmented perspective view of a first spool coupled to a first base and having a plurality of first belts and a plurality of first rollers.

FIG. **13** is an exploded perspective view of the first spool coupled to the first base with the plurality of first belts and the plurality of first rollers.

FIG. **14** is another perspective view of the first spool coupled to the first base with the plurality of first belts and the plurality of first rollers.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the Figures wherein like numerals indicate like or corresponding parts throughout the several views, a lift system **20** including a first scissor-type lift assembly **22** and a second scissor-type lift assembly **24** spaced from the first scissor-type lift assembly **22** is generally shown in FIG. **1**.

The first scissor-type lift assembly **22** includes a first base **26** and a first platform **28** coupled to the first base **26** for movement between elevated and lowered states in which the first platform **28** and the first base **26** are distant and proximate, respectively. The first scissor-type lift assembly **22** includes a first motor **30** mounted to the first base **26** to move the first platform **28** between the elevated and lowered states. The first scissor-type lift assembly **22** is shown in the elevated stated in FIGS. **1** and **2**.

The second scissor-type lift assembly **24** includes a second base **32** and a second platform **34** coupled to the second base **32** for movement between elevated and lowered states in which the second platform **34** and the second base **32** are distant and proximate, respectively. The second scissor-type lift assembly **24** includes a second motor **36** mounted to the second base **32** to move the second platform **34** between the elevated and lowered states.

As shown schematically in FIG. **1**, the lift system **20** includes a controller **38** in communication with the first and second motors **30**, **36** to synchronize operation of the first and second motors **30**, **36** for moving the first and second platforms **28**, **34** between the associated elevated and lowered states in synchronization. The controller **38** has encoders (not shown) which sense and maintain the synchronization of the first and second motors **30**, **36**. It is to be appreciated that the controller may have a wired connection to the first and second motors **30**, **36** or may have a wireless connection to the first and second motors **30**, **36**. It is to be appreciated that the lift system **20** may use the controller **38** with any suitable number of platforms or motors. It is to be appreciated that the encoders may be any suitable type of electronic control component such as a sensor.

As shown in FIGS. **1** and **3**, the first and second bases **26**, **32** are interconnected for synchronized movement of the first and second bases **26**, **32**. Specifically, the first and second bases **26**, **32** are integral with each other. It should be appreciated that the first and second base **26**, **32** may be separate components of the lift system **20** coupled to each other or separate components spaced from each other. Referring to FIG. **3**, the first and second platforms **28**, **34** can be interconnected for synchronized movement of the first and second platforms **28**, **34**. It should be appreciated that the first and second platforms **28**, **34** may be separate components of the lift system **20** coupled to each other.

The following disclosure describes components and features of the first scissor-type lift assembly **22** of the lift system **20**. It should be appreciated that the second scissor-type lift assembly **24** includes corresponding components and features as the first scissor-type lift assembly **22** and operates in substantially the same fashion as the first scissor-type lift assembly **22**. The same numbers assigned to the components or features of the first scissor-type lift assembly **22** are used to identify equivalent components and features of the second scissor-type lift assembly **24** in the figures with the exception of components and features of the second scissor-type lift assembly **24** previously numbered.

The first base **26** and the first platform **28**, each of which may be metal, are distant as the first platform **28** is in the elevated state. The first base **26** and the first platform **28** are proximate as the first platform **28** is in the lowered state. It is to be appreciated that the first platform **28** can be moved to states between the elevated and lowered states. It is to be appreciated that the first base **26** and the first platform **28** may be any suitable alternative material such as wood or plastic.

The first scissor-type lift assembly **22** includes a first and second pair of scissor arms **40**, **42**, each of which may be made of steel. The first pair of scissor arms **40** are spaced from

the second pair of scissor arms **42** and are transverse to the first base **26** and the first platform **28**. The first and second pair of scissor arms **40**, **42** each include a first arm **44** and a second arm **46** spaced from the first arm **44** along the first pivot axis A**1**. It is to be appreciated that the first and second pair of scissor arms **40**, **42** may be any suitable alternative metal such as iron or any suitable alternative material such as wood or plastic.

The first and second pair of scissor arms **40**, **42** each have upper and lower ends **48**, **50** respectively coupled to each of the first platform **28** and the first base **26**. The upper ends **48** of the first and second pair of scissor arms **40**, **42** are coupled to the first platform **28**. The lower ends **50** of the first and second pair of scissor arms **40**, **42** are coupled to the first base **26**.

The first base **26** has a pair of first tracks **52** with the lower ends **50** of the first arms **44** movably disposed in the pair of first tracks **52**. The pair of first tracks **52** guide the lower ends **50** of the first arms **44** to move along the first base **26** as the first platform **28** moves between the elevated and lowered states. The first platform **28** has a pair of second tracks (not shown) with the upper ends **48** of the second arms **46** movably disposed in the pair of second tracks. The pair of second tracks guide the upper ends **48** of the second arms **46** to move along the first platform **28** as the first platform **28** moves between the elevated and lowered states.

The first and second pair of scissor arms **40**, **42** are connected to each other intermediate their respective upper and lower ends **48**, **50** about a first pivot axis A**1** for pivoting relative to each other during the movement of the first platform **28** between the elevated and lowered states. The first pivot axis A**1** is transverse to the first pair of scissor arms **40** and moves as the first platform **28** moves between the elevated and lowered states. As shown FIGS. **4-6**, the first pair of scissor arms **40** define a first pair of holes **54** aligned with each other along the first pivot axis A**1**. As shown FIGS. **7** and **8**, the second pair of scissor arms **42** define a second pair of holes **56** aligned with each other along the first pivot axis A**1**.

As shown in FIGS. **5** and **6**, the first scissor-type lift assembly **22** includes a first shaft **58** disposed along the first pivot axis A**1**. The first shaft **58** has a cylindrical configuration and a first shaft diameter D**1**. The first shaft **58** is disposed in the first pair of holes **54** of the first pair of scissor arms **40** aligned with and along the first pivot axis A**1**. The first pair of scissor arms **40** are pivotably disposed about the first shaft **58**. It is to be appreciated that the first shaft **58** may be any alternative configuration such as a tubular configuration.

The first shaft **58** has a first end **60** and a second end **62** spaced from the first end **60** along the first pivot axis A**1**. The first and second ends **60**, **62** extend from the first pair of scissor arms **40** with the second end **62** terminating at a first shaft face **64**. The first end **60** extends from the first arm **44** of the first pair of scissor arms **40** toward the second pair of scissor arms **42**. The second end **62** extends from the second arm **46** of the first pair of scissor arms **40** away from the second pair of scissor arms **42**. The first shaft face **64** is transverse to the first pivot axis A**1**.

The first scissor-type lift assembly **22** includes a first spacer **66** disposed about the first shaft **58** between the first pair of scissor arms **40** to space the first pair of scissor arms **40** from each other along the first pivot axis A**1**. The first spacer **66** has a tubular configuration and may be made of plastic. The first spacer **66** prevents the first arms **44** and the second arms **46** from interfering with each other as the first pair of scissor arms **40** pivot about the first pivot axis A**1**. It is to be appreciated that the first spacer **66** may be fixed to the first shaft **58** or rotatably disposed about the first shaft **58**. It is to be appreciated that the first shaft **58** may be any suitable alternative configuration such as a rectangular cuboid configuration with a void defined along the first pivot axis A**1**. It is to be appreciated that the first spacer **66** may be any suitable alternative material with friction reducing properties such as a lubricated metal.

As shown in FIGS. **4-6**, the scissor-type lift assembly includes a first brace **68** fixed to another one of the first pair of scissor arms **40**. In the illustrated embodiment, the first brace **68** has a rectangular cuboid configuration and is fixed to the second arm **46** of the first pair of scissor arms **40** transverse to the first pivot axis A**1**. The first brace **68** has a first brace face **70** facing the second arm **46**. Referring to FIG. **5**, the first brace **68** has a first length L**1** greater than the first shaft diameter D**1** of the first shaft **58**. It is to be appreciated that the first brace **68** may have any suitable alternative configuration such as a cylindrical configuration with a diameter greater than the first shaft diameter D**1** of the first shaft **58**.

The first brace **68** abuts the first shaft face **64** of the first shaft **58** to maintain alignment of the first shaft **58** along the first pivot axis A**1** for reducing wear between the first pivot axis A**1** and the first pair of scissor arms **40**. Specifically, the first shaft face **64** is parallel to and abuts the first brace face **70**. The first brace face **70** abuts the first shaft face **64** and applies a compressive force to the first shaft **58** to prevent pivoting of the first shaft **58** away from alignment with the first pivot axis A**1**.

As shown in FIGS. **5** and **6**, the first brace **68** has a first central portion **72** and a first support portion **74** extending from the first central portion **72** toward the another one of the first pair of scissor arms **40** to define a first gap **76** between said first central portion **72** and the another of the first pair of scissor arms **40**. The first brace face **70** is defined by the first central portion **72** of the first brace **68** with the first gap **76** partially defined by the first brace face **70**. The first shaft face **64** is disposed in the first gap **76**. Specifically, the second end **62** of the first shaft **58** extends from the second arm **46** of the first pair of scissor arms **40** and is disposed in the first gap **76**.

As shown in FIGS. **4** and **5**, the first support portion **74** is further defined as a pair of first support portions **74**. In the illustrated embodiment, the pair of first support portions **74** have a rectangular cuboid configuration and are disposed between the first brace **68** and the second arm **46** of the first pair of scissor arms **40**. The first brace **68** has opposing distal ends **78**. The opposing distal ends **78** are spaced from each other and are defined relative to the pair of first support portions **74** of the first brace **68**. The pair of first support portions **74** partially define the first gap **76** with the second end **62** of the first shaft **58** disposed between the pair of first support portions **74**. It is to be appreciated that the pair of first support portions **74** may be any alternative suitable configuration such as a cylindrical configuration. It is to be appreciated that the pair of first support portions **74** may be integral with the first central portion **72**.

One of the pair of first support portions **74** extends from each of the opposing distal ends **78** of the first brace **68**. It is appreciated that the pair of first support portions **74** may be mounted to the first brace **68** in any suitable method such as being fixed to the first brace **68**, being disposed between the first brace **68** and the second arm **46** of the first pair of scissor arms **40**, or being integral with the first brace **68**.

The first scissor-type lift assembly **22** includes a first plurality of fasteners **80** extending through the pair of first support portions **74** to secure the first brace **68** to another one of the first pair of scissor arms **40**. Specifically, the first plurality of fasteners **80** are disposed in the pair of first support portions **74** and are secured to the second arm **46** of the first pair of

scissor arms **40**. The first plurality of fasteners **80** are further defined as bolts. It is to be appreciated that the first plurality of fasteners **80** may be any alternative fastener such as a screw.

As shown in FIGS. **4-6**, the first scissor-type lift assembly **22** includes a first flange **84** coupled to the first shaft **58** to further define the first shaft face **64** and further maintain alignment of the first shaft **58** along the first pivot axis A**1** for reducing wear between the first pivot axis A**1** and the first pair of scissor arms **40**. As illustrated, the first flange **84** is fixed to the second end **62** of the first shaft **58** and is disposed in the first gap **76** between the pair of first support portions **74**. The first flange **84** may be separately mounted to the first scissor-type lift assembly **22** (as shown) or the first flange **84** may be integral with the first shaft **58**.

Referring to FIGS. **5** and **6**, the first flange **84** has a substantially flat washer like configuration defining a first cavity **86** about the first pivot axis A**1**. It is to be appreciated that the first flange **84** may be any suitable alternative configuration such as a solid cylindrical configuration.

The first shaft **58** has a first shaft periphery **88** with a circular configuration. The first flange **84** has a first flange periphery **90**. Specifically referring to FIG. **5**, the first flange **84** has a first flange diameter D**2** and the first flange periphery **90** has a circular configuration. The first flange periphery **90** is disposed radially further from the first pivot axis A**1** than the first shaft periphery **88** to further maintain alignment of the first shaft **58** along the first pivot axis A**1** for reducing wear between the first pivot axis A**1** and the first pair of scissor arms **40**. Specifically, the first flange diameter D**2** is greater than the first shaft diameter D**1** of the first shaft **58** with the first flange **84** extending further from the first pivot axis A**1** than the first shaft **58** to engage the second arm **46** of the first pair of scissor arms **40** and the first brace **68** to prevent the first shaft **58** from moving along the first pivot axis A**1** toward the second pair of scissor arms **42**. The first flange **84** prevents tilting or rocking of the first shaft **58** out of alignment with the first pivot axis A**1**. Said differently, the first flange **84** prevents the first shaft **58** from wobbling in the first pair of holes **54** of the first pair of scissor arms **40**. It is to be appreciated that the first flange **84** may directly abut the another one of the first pair of scissor arms **40**.

As shown in FIGS. **5-6**, the first scissor-type lift assembly **22** includes a first bushing **92**. The first bushing **92** has an annular configuration and may be made of as plastic. The first bushing **92** is disposed between the first flange **84** and the another one of the first pair of scissor arms **40** to reduce friction between the first flange **84** and the another one of the first pair of scissor arms **40** as the first pair of scissor arms **40** pivots about the first pivot axis A**1**. The first flange **84** and the first bushing **92** engage the second arm **46** of the first pair of scissor arms **40** and first brace **68** to prevent the first shaft **58** from pivoting away from alignment with the first pivot axis A**1**. The first bushing **92** also reduces friction between the first flange **84** and the second arm **46** of the first pair of scissor arms **40** as the first pair of scissor arms **40** pivot about the first pivot axis A**1**. Specifically, the first bushing **92** is disposed about the first shaft **58** between the first flange **84** and the second arm **46** of the first pair of scissor arms **40**. As the first pair of scissor arms **40** pivot, the first flange **84** and first bushing **92** abuts the second arm **46** and prevents pivoting of the first shaft **58**. It is to be appreciated that the first bushing **92** may be of any suitable alternative materials with friction reducing properties such as a lubricated metal. It is to be appreciated that the first bushing **92** may be of any suitable alternative configuration such as a rectangular cuboid.

The first scissor-type lift assembly **22** can also include a first plate or shim **82** coupled to the first shaft **58** to further define the first shaft face **64** and to further maintain alignment of the first shaft **58** along the first pivot axis A**1** for reducing wear between the first pivot axis A**1** and the first pair of scissor arms **40**. Specifically, the first plate **82** is disposed in the first gap **76** between the first flange **84** and the first brace **68**. The first plate **82** is also disposed in the first gap **76** between the first shaft **58** or the first flange **84** and the first brace **68** to ensure contact between the first shaft **58** or first flange **84** and the first brace **68**. It is to be appreciated that the first scissor-type lift assembly **22** may include the first plate **82** and the first flange **84** with the first plate **82** defining the first shaft face **64** and the first flange **84** disposed between the second end **62** of the first shaft **58** and the first plate **82**.

The first shaft **58** defines a first groove **94** about the first end **60**. The first groove **94** is defined in the first shaft **58** about the first pivot axis A**1**. The first scissor-type lift assembly **22** includes a first retention device **96** coupled to the first end **60** of the first shaft **58**. The first retention device **96** has tubular configuration and is disposed about the first end **60**. Specifically, the first retention device **96** disposed about the first shaft **58** and aligned with the first groove **94**. It is to be appreciated that the first retention device **96** may be any suitable alternative configuration such as a cylindrical configuration.

The first scissor-type lift assembly **22** includes a first retention fastener **98** extending through the first retention device **96** and disposed in the first groove **94** of the first shaft **58** to secure the first retention device **96** to the first shaft **58**. Specifically, the first retention fastener **98** is further defined as a bolt. The first retention fastener **98** prevents the first retention device **96** from moving along the first shaft **58** away from the first arm **44** of the first pair of scissor arms **40**. The first retention device **96** prevents the first shaft **58** from moving along the first pivot axis A**1** away from the second pair of scissor arms **42**. It is to be appreciated that the first retention fastener **98** may be any suitable alternative fastener such as a screw.

The first scissor-type lift assembly **22** includes a first retention bushing **100**. The first retention bushing **100** has a tubular configuration and may be made of as plastic. The first retention bushing **100** is disposed between the first retention device **96** and the first arm **44** of the first pair of scissor arms **40** with the first shaft **58** reducing friction between the first retention device **96** and the first arm **44** of the first pair of scissor arms **40** as the first pair of scissor arms **40** pivot about the first pivot axis A**1**. It is to be appreciated that the first retention bushing **100** may be of any suitable alternative materials with friction reducing properties such as a lubricated metal. It is to be appreciated that the first retention bushing **100** may be of any suitable alternative configuration such as a rectangular cuboid.

The first shaft **58** has a first removal feature **102** defined in the second end **62** for removing the first shaft **58** from the first pair of scissor arms **40**. Specifically, the first shaft **58** defines the first removal feature **102** as a threaded void extending through the first shaft face **64**. The first removal feature **102** is defined in the first cavity **86** of the first flange **84**. An operator may insert a threaded rod (not shown) into the first removal feature **102** and use a removal tool (not shown) to pull the first shaft **58** along the first pivot axis A**1** and remove the first shaft **58** from the first pair of scissor arms **40**.

As shown in FIGS. **7** and **8**, the second scissor-type lift assembly **24** includes a second shaft **104** disposed along the first pivot axis A**1**. The second shaft **104** has a second shaft diameter D**3**. The second shaft **104** is disposed in the second pair of holes **56** of the second pair of scissor arms **42** aligned

with and along the first pivot axis A1. The second pair of scissor arms **42** are pivotably disposed about the second shaft **104**.

The second shaft **104** has a third end **106** and a fourth end **108** spaced from the third end **106** along the first pivot axis A1. The third and fourth ends **106**, **108** extend from the second pair of scissor arms **42** with the fourth end **108** terminating at a second shaft face **110**. The third end **106** extends from the first arm **44** of the second pair of scissor arms **42** toward the first pair of scissor arms **40**. The fourth end **108** extends from second arm **46** of the second pair of scissor arms **42** away from the first pair of scissor arms **40**.

The second scissor-type lift assembly **24** includes a second spacer **112** disposed about the second shaft **104** between the second pair of scissor arms **42** to space the second pair of scissor arms **42** from each other along the first pivot axis A1. The second spacer **112** prevents the first arms **44** and the second arms **46** from interfering with each other as the second pair of scissor arms **42** pivot about the first pivot axis A1. It is to be appreciated that the second spacer **112** may be fixed to the second shaft **104** or rotatably disposed about the second shaft **104**.

The scissor-type lift assembly includes a second brace **114** fixed to another one of the second pair of scissor arms **42**. In the illustrated embodiment, the second brace **114** has a second brace face **116** with a second length L2 greater than the second shaft diameter D3 of the second shaft **104**. The second brace **114** abuts the second shaft face **110** of the second shaft **104** to maintain alignment of the second shaft **104** along the first pivot axis A1 for reducing wear between the first pivot axis A1 and the second pair of scissor arms **42**. The second brace face **114** abuts the second shaft face **110** and applies a compressive force to the second shaft **104** to prevent pivoting of the second shaft **104** away from alignment with the first pivot axis A1.

The second brace **114** has a second central portion **118** and a second support portion **120** extending from the second central portion **118** toward the another one of the second pair of scissor arms **42** to define a second gap **122** between said second central portion **118** and the another of the second pair of scissor arms **42**. The second brace face **116** is defined by the second central portion **118** of the second brace **114** and the second gap **122** is partially defined by the second brace face **116**. The second shaft face **110** is disposed in the second gap **122**. Specifically, the fourth end **108** of the second shaft **104** extends from the second arm **46** of the second pair of scissor arms **42** and is disposed in the second gap **122**.

The second support portion **120** is further defined as a pair of second support portions **120**. The second brace **114** has opposing distal ends **124**. The opposing distal ends **124** are spaced from each other and are defined in the pair of second support portions **120** of the second brace **114**. The pair of second support portions **120** are disposed between the second brace **114** and another one of the second pair of scissor arms **42**. The second brace **114** has a opposing distal ends **124**.

One of the pair of second support portions **120** extends from each opposing distal ends **124** of the second brace **114**. The second scissor-type lift assembly **24** includes a second plurality of fasteners **126** extending through the pair of second support portions **120** to secure the second brace **114** to another one of the second pair of scissor arms **42**. Specifically, the second plurality of fasteners **126** are disposed in the pair of second support portions **120** and are secured to the second arm **46** of the second pair of scissor arms **42**.

The second scissor-type lift assembly **24** includes a second flange **130** coupled to the second shaft **104** to further define the second shaft face **110** and further maintain alignment of the second shaft **104** along the first pivot axis A1 for reducing wear between the first pivot axis A1 and the second pair of scissor arms **42**. As illustrated, the second flange **130** is fixed to the second end **109** of the second shaft **104** and is disposed in the second gap **122** between the pair of second support portions **120**. The second flange **130** may be separately mounted to the second scissor-type lift assembly **24** (as shown) or the second flange **130** may be integral with the second shaft **104**. The second flange **130** defines a second cavity **132** about the first pivot axis A1.

The second shaft **104** has a second shaft periphery **136**. The second flange **130** has a second flange periphery **136**. The second flange **130** has a second flange diameter D3 and the second flange periphery **136** has a circular configuration. The second flange periphery **136** is disposed radially further from the first pivot axis A1 than the second shaft periphery **136** to further maintain alignment of the second shaft **104** along the first pivot axis A1 for reducing wear between the first pivot axis A1 and the second pair of scissor arms **42**. Specifically, the second flange diameter D3 is greater than the second shaft diameter D2 of the second flange **130** with the second flange **130** extending further from the first pivot axis A1 than the second shaft **104** to engage both the second arm **46** of the second pair of scissor arms **42** and the second brace **114** to prevent the second shaft **104** from moving along the first pivot axis A1 toward the first pair of scissor arms **40**. The second flange **130** prevents tilting or rocking of the second shaft **104** out of alignment with the first pivot axis A1. Said differently, the second flange **130** prevents the second shaft **130** from wobbling in the second pair of holes **56** of the second pair of scissor arms **42**. It is to be appreciated that the second flange **130** may directly abut the another one of the second pair of scissor arms **42**.

The second scissor-type lift assembly **24** includes a second bushing **138**. The second bushing **138** is disposed between the second flange **130** and the another one of the second pair of scissor arms **42** to reduce friction between the second flange **130** and the another one of the second pair of scissor arms **42** as the second pair of scissor arms **42** pivots about the first pivot axis A1. The second bushing **138** disposed about the fourth end **108** of the second shaft **104**. The second bushing **138** abuts the second arm **46** of the second pair of scissor arms **42** and the second flange **130**. Specifically, the second bushing **138** is disposed about the second shaft **104** between the second flange **130** and the second arm **46** of the second pair of scissor arms **42**. As the second pair of scissor arms **42** pivot, the second flange **130** and the second bushing **138** abut the second arm **46** and prevent pivoting of the second shaft **104**.

The second scissor-type lift assembly **24** includes a second plate or shim **128** coupled to the second shaft **104** to further define the second shaft face **110** and to further maintain alignment of the second shaft **104** along the first pivot axis A1 for reducing wear between the first pivot axis A1 and the second pair of scissor arms **42**. Specifically, the second plate **128** is disposed in the second gap **122** between the second flange **130** and the second brace **114**. The second plate **128** is disposed in the second gap **122** between the second shaft **104** or the second flange **130** and the second brace **114** to ensure contact between the second shaft **104** or the second flange **130** and the second brace **114**. It is to be appreciated that the second scissor-type lift assembly **24** may include the second plate **128** and the second flange **130** with the second plate **128** defining the second shaft face **110** and the second flange **130** disposed between the fourth end **108** of the second shaft **104** and the second plate **128**.

The second shaft **104** defines a second groove **140** about the third end **106**. The second scissor-type lift assembly **24**

includes a second retention device **142** coupled to the third end **106** of the second shaft **104**. Specifically, the second retention device **142** disposed about the second shaft **104** and aligned with the second groove **140**.

The second scissor-type lift assembly **24** includes a second retention fastener **144** extending through the second retention device **142** and disposed in the second groove **140** of the second shaft **104** to secure the second retention device **142** to the second shaft **104**. The second retention device **142** prevents the second shaft **104** from moving along the first pivot axis A1 away from the first pair of scissor arms **40**. The second shaft **104** has a second removal feature **148** defined in the fourth end **108** for removing the second shaft **104** from the second pair of scissor arms **42**.

As shown in FIGS. **1** and **3**, the first scissor-type lift assembly **22** includes a first guide arrangement **150** mounted to the first and second pair of scissor arms **40**, **42**. Specifically, the first guide arrangement **150** is further defined as a first engagement shaft **152** and a first pulley shaft **154**. The first engagement shaft **152** is movably disposed between the second arms **46** of the first and second pair of scissor arms **40**, **42**. The first pulley shaft **154** is disposed between the lower ends **50** of the first arms **44** of the first and second pair of scissor arms **40**, **42**. The first pulley shaft **154** defines a first pulley axis A2 and has a first pulley **156** rotatably disposed about the first pulley shaft **154**.

The first and second pair of scissor arms **40**, **42** have a first pair of rods **158** with one of the first pair of rods **158** coupled to one of the first arms **44** and another one of the first pair of rods **158** coupled to another one of the first arms **44**. The first pair of rods **158** have a cylindrical configuration and extend along the first arms **44** between the upper ends **48** of the first arms **44** and the first pivot axis A1. As shown in FIG. **11**, the first pair of rods **158** have a lowered rod end (not shown) relative to the upper ends **48** of the first arms **44** and an elevated rod end **160** relative the first pivot axis A1. It is to be appreciated that the first pair of rods **158** may be any suitable alternative configuration such as a rectangular cuboid configuration.

As shown in FIGS. **1** and **3**, the first and second pair of scissor arms **40**, **42** have a first pair of cams **162** with one of the first pair of cams **162** extending from one of the second arms **46** and another one of the first pair of cams **162** extending from another one of the second arms **46**. The first pair of cams **162** have an arcuate configuration and extend along the second arms **46** between the lower ends **50** and the first pivot axis A1. The first pair of cams **162** have a lowered cam end **164** relative to the lower ends **50** of the second arms **46** and an elevated rod end **160** (not shown) relative the first pivot axis A1. It is to be appreciated that the first pair of cams **162** may be any suitable alternative configuration such as a flat configuration.

As shown in FIGS. **1**, **3**, and **10**, the first engagement shaft **152** has a first pair of cam followers **166** with one of the first pair of cam followers **166** rotatably abutting one of the first pair of cams **162** and another one of the first pair of cam followers **166** rotatably abutting the another one of the first pair of cams **162**. The first pair of cam followers **166** are disposed along the first pair of cams **162** at the lowered cam ends **164** as the first platform **28** is in the lowered state and the first pair of cam followers **166** are disposed along the first pair of cams **162** at the elevated cam ends as the first platform **28** is in the elevated state. As the first and second pair of scissor arms **40**, **42** pivot about the first pivot axis A1, the first pair of cam followers **166** move along the first pair of cams **162** to lower and raise the first platform **28**.

As shown in FIGS. **1**, **3**, and **10-11**, the first engagement shaft **152** has a first pair of rod followers **168** with one of the first pair of rod followers **168** rotatably abutting one of the first pair of rods **158** and another one of the first pair of rod followers **168** rotatably abutting another one of the first pair of rods **158**. The first pair of rod followers **168** are disposed along the first pair of rods **158** at the lowered rod ends as the first platform **28** is in the lowered state and the first pair of rod followers **168** are disposed along the first pair of rods **158** at the elevated rod ends **160** as the first platform **28** is in the elevated state. As the first and second pair of scissor arms **40**, **42** pivot about the first pivot axis A1, the first pair of rod followers **168** move along the first pair of rods **158** to lower and raise the first platform **28**.

The first guide arrangement **150** is movable with the first and second pair of scissor arms **40**, **42** during movement of the first platform **28**. The first engagement shaft **152** moves along the first pair of rods **158** and the first pair of cams **162** as the first and second pair of scissor arms **40**, **42** pivot and the first platform **28** moves between the elevated and lowered states. The first pulley shaft **154** moves along the first base **26** as the first and second pair of scissor arms **40**, **42** pivot and the first platform **28** moves between the elevated and lowered states.

As shown in FIGS. **10** and **11**, the first scissor-type lift assembly **22** includes a first pair of interfaces **170** at which the first engagement shaft **152** engages the first and second pair of scissor arms **40**, **42**. Specifically, the first pair of interfaces **170** are defined as the first pair of rod followers **168** rotatably abut the first pair of rods **158** of the first arms **44**. The first scissor-type lift assembly **22** includes a first pair of lubrication features **172** coupled to the first engagement shaft **152** with the first pair of lubrication features **172** lubricating the first pair of interfaces **170** as the first platform **28** moves between the elevated and lowered states. Specifically, the first pair of lubrication features **172** lubricate the first pair of rod followers **168** as the first pair of rod followers **168** move along the first pair of rods **158**.

As shown in FIGS. **1**, **3** and **12-14**, the first scissor-type lift assembly **22** includes a first spool **174** coupled to the first base **26** and defining a first spool axis A3. The first scissor-type lift assembly **22** has a first spool shaft **176** rotatably mounted to the first base **26** and extending along the first spool axis A3. The first spool shaft **176** is rotatably coupled to the first motor **30**. The first spool **174** has a first spool base **178** disposed about the first spool shaft **176** along the first spool axis A3. The first spool **174** and the first spool base **178** rotate about the first spool axis A3 as a unit. The first spool **174** has a first pair of spool flanges **180** spaced from each along the first spool axis A3 and abutting the first spool base **178**.

As shown in FIGS. **1** and **3**, the first guide arrangement **150** defines a first path. The first path is defined from the first spool **174** along the first base **26** to the first pulley **156** of the first engagement shaft **152**. The first path is defined about the first pulley **156** of the first engagement shaft **152** and between the first arms **44** to the first pulley shaft **154**. It is to be appreciated that the first path may have any suitable alternative route or configuration depending on the number of pulleys or shafts.

The first scissor-type lift assembly **22** includes a first belt **182** routed through the first path of the first guide arrangement **150**. The first belt **182** has a primary end **184** engaged with the first spool **174** onto which the first belt **182** is wound and from which the first belt **182** is unwound. Specifically, the primary end **184** of the first belt **182** is fastened to the first spool base **178**. The first belt **182** is coupled to and wound about the first spool base **178** between the first pair of spool flanges **180**. The first belt **182** has a secondary end (not shown) engaged with

the first engagement shaft **152**. It should be appreciated the first belt **182** may be fastened to the first spool **174** in any suitable manner such as being bolted to the first spool **174**. It should be appreciated the first belt **182** may be any suitable alternatives such as a rope or a cable.

The first belt **182** is routed through the first path about the first pulley shaft **154** and coupled to the first engagement shaft **152** for reducing the force required to move the first platform **28** between the elevated and lowered states. Specifically, the primary end **184** of the first belt **182** is coupled to the first spool **174** relative to the lower ends **50** of the second arms **46**. The first belt **182** extends along the first base **26** towards the lower ends **50** of the first arms **44** and to the first pulley shaft **154**. The first belt **182** is disposed about the first pulley **156** of the first engagement shaft **152** and extends between the first arms **44** towards the first pivot axis A**1** and is coupled to the first engagement shaft **152**.

The first belt **182** is further defined as a plurality of first belts **182** routed through the first path defined by the first guide arrangement **150**. The plurality of first belts **182** each have a pair of edges **186**. Specifically, the plurality of first belts **182** are defined as three first belts **182** routed through the first path defined by the first guide arrangement **150**.

The first scissor-type lift assembly **22** includes a plurality of first rollers **188** movably disposed about the first spool **174**. The plurality of first rollers **188** each have a pair of outer surfaces **190**. Specifically, the plurality of first rollers **188** are defined as two first rollers **188** disposed about the first spool base **178** between the first pair of spool flanges **180**. One of the plurality of first rollers **188** is disposed between two of the plurality of the first belts **182** to align the plurality first belts **182** as the first spool **174** winds and unwinds the plurality first belts **182**. The plurality of first rollers **188** are movable along and about the first spool base **178**. The plurality of rollers **188** move with the plurality of first belts **182** as the first belts **182** wind and unwind about the first spool base **178**. The first pair of outer surfaces **190** of the plurality of rollers abut the pair of edges **186** of the plurality of first belts **182** as the plurality of first belts **182** are wound and unwound to align the plurality of first belts **182** on the first spool base **178**. The alignment of the plurality of first belts **182** on the first spool base **178** prevents fraying and deterioration of the plurality of first belts **182**.

The first motor **30** is mounted to the first base **26** and is operatively coupled to the first spool **174** to wind and unwind the first belt **182** through the first path to move the first and second pair of scissor arms **40**, **42** and move the first platform **28** between the elevated and lowered states. The first motor **30** is coupled to the first spool shaft **176** to rotate the first spool **174** about the first spool axis A**3** in a first direction R1 to wind the plurality of first belts **182** onto and about the first spool base **178** to raise the first platform **28**. The first motor **30** also rotates the first spool **174** about the first spool axis A**3** in a second direction R2 to unwind the plurality of first belts **182** from the first spool base **178** to lower the first platform **28**.

As the first and second platforms **28**, **34** are in the lowered state, an operator engages the controller **38** to operate the first and second motors **30**, **36** in synchronization to raise the first and second platforms **28**, **34** to the elevated state. The lift system **20** may be precisely controlled with the first motor **30** of the first scissor-type lift assembly **22** and the second motor **36** of the second scissor-type lift assembly **24** both in communication with and controlled by the controller **38**.

As the operator utilizes the controller **38** and initiates the first scissor-lift assembly **22**, the first motor **30** rotates the first spool shaft **176** and the first spool **174** about the first spool axis A**3** in the first direction R1. As the first spool **174** rotates in the first direction R1, the plurality of first belts **182** are wound about the first spool base **178**. The plurality of first rollers **188** guide and align the plurality of first belts **182** onto the first spool base **178**. As the plurality of first belts **182** are wound about the first spool base **178**, the plurality of first belts **182** exert a force along the first path to engage the first engagement shaft **152**. The force moves the first pair of cam followers **166** along the first pair of cams **162** from the lowered cam ends **164** toward the elevated cam ends and moves the first pair of rod followers **168** along the first pair of rods **158** from the lowered rod ends toward the elevated rod ends **160**.

As the first pair of cam followers **166** move along the first pair of cams **162** and the first pair of rod followers **168** move along the first pair of rods **158**, the first and second pair of scissor arms **40**, **42** pivot about the first pivot axis A**1** with the lower ends **50** of the first arms **44** moving along the pair of first tracks **52** and the upper arms of the second arms **46** moving along the pair of second tracks. As the first and second pair of scissor arms **40**, **42** pivot about the first pivot axis A**1**, the first platform **28** moves from the lowered state to the elevated state until the operator disengages the controller **38** to cease operation of the first motor **30** or until the first pair of cam followers **166** move along the first pair of cams **162** to the elevated cam ends and the first pair of rod followers **168** move along the first pair of rods **158** to the elevated rod ends **160**.

As the first and second platforms **28**, **34** are in the elevated state, an operator can utilize the controller **38** to operate the first and second motors **30**, **36** to lower the first and second platforms **28**, **34** to the lowered state. The operator engages the controller **38** to initiate synchronized operation of the first and second motors **30**, **36**.

As the operator utilizes the controller **38** and initiates the first scissor-lift assembly **22**, the first motor **30** rotates the first spool shaft **176** and the first spool **174** about the first spool axis A**3** in the second direction R2. As the first spool **174** rotates in the first direction D**2**, the plurality of first belts **182** are unwound from the first spool base **178**. The plurality of first rollers **188** guide and align the plurality of first belts **182** away the first spool base **178**. As the plurality of first belts **182** are unwound about the first spool base **178**, the plurality of first belts **182** release the force exerted along the first path to holding the first engagement shaft **152** along the second arms **46**. The releasing of the force moves the first pair of cam followers **166** along the first pair of cams **162** from the elevated cam ends toward the lowered cam ends **164** and moves the first pair of rod followers **168** along the first pair of rods **158** from the elevated rod ends **160** toward the lowered rod ends.

As the first pair of cam followers **166** move along the first pair of cams **162** and the first pair of rod followers **168** move along the first pair of rods **158**, the first and second pair of scissor arms **40**, **42** pivot about the first pivot axis A**1** with the lower ends **50** of the first arms **44** moving along the pair of first tracks **52** and the upper arms of the second arms **46** moving along the pair of second tracks. As the first and second pair of scissor arms **40**, **42** pivot about the first pivot axis A**1**, the first platform **28** moves from the elevated state to the lowered state until the operator disengages the controller **38** to cease operation of the first motor **30** or until the first pair of cam followers **166** move along the first pair of cams **162** to the lowered cam ends **164** and the first pair of rod followers **168** move along the first pair of rods **158** to the lowered rod ends.

As the first pair of scissor arms **40** pivot about the first pivot axis A**1**, the first retention device **96** and the first retention bushing **100** are secured to the first end **60** of the first shaft **58** and engage the first arm **44** of the first pair of scissor arms **40**. The first retention device **96** prevents movement of the first

shaft **58** along the first pivot axis A**1** away from the second pair of scissor arms **42**. The first flange **84** and the first bushing **92** engage the second arm **46** of the first pair of scissor arms **40** with the first flange **84** preventing movement of the first shaft **58** along the first pivot axis A**1** towards the second pair of scissor arms **42**.

The first brace **68** is secured to the second arms **46** of the first pair of scissor arms **40** of the first flange **84** and the first bushing **92** with the second arm **46** of the first pair of scissor arms **40**. The engagement of the first flange **84** and the second arm **46** prevents the first shaft **58** from tilting or rocking and retains the first shaft **58** in alignment along the first pivot axis A**1** to reduce wear to the first shaft **58** and the first pair of scissor arms **40** as the first pair of scissor arms **40** pivot about the first pivot axis A**1**.

As the second pair of scissor arms **42** pivot about the first pivot axis A**1**, the second retention device **142** and the second retention bushing **146** are secured to the third end **106** of the second shaft **104** and engage the first arm **44** of the second pair of scissor arms **42**. The second retention device **142** prevents movement of the second shaft **104** along the first pivot axis A**1** away from the first pair of scissor arms **40**. The second flange **130** and the second bushing **138** engage the second arm **46** of the second pair of scissor arms **42** with the second flange **130** preventing movement of the second shaft **104** along the first pivot axis A**1** towards the first pair of scissor arms **40**.

The second brace **114** is secured to the second arm **46** of the second pair of scissor arms **42** with the second brace face **116** abutting the second shaft face **110**. The second brace **114** applies the compressive force to the second plate **128** to retain the engagement of the second flange **130** and the second bushing **138** with the second arm **46** of the second pair of scissor arms **42**. The engagement of the second flange **130** and the second arm **46** prevents the second shaft **104** from tilting or rocking and retains the second shaft **104** in alignment along the first pivot axis A**1** to reduce wear to the second shaft **104** and the second pair of scissor arms **42** as the second pair of scissor arms **40** pivot about the first pivot axis A**1**.

The invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation. As is now apparent to those skilled in the art, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, wherein reference numerals are merely for convenience and are not to be in any way limiting, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A scissor-type lift assembly comprising:

a base;

a platform coupled to said base for movement between elevated and lowered states in which said platform and said base are distant and proximate, respectively;

a first pair of scissor arms each having upper and lower ends respectively coupled to each of said platform and said base, said first pair of scissor arms pivotably connected to each other intermediate their respective upper and lower ends about a first pivot axis;

a first shaft disposed along said first pivot axis, and having a first end and a second end spaced from said first end along said first pivot axis with said first pair of scissor arms pivotably disposed about said first shaft, and said first and second ends extending from said first pair of scissor arms with said second end terminating at a first shaft face;

a first retention device coupled to said first end of said first shaft with said first retention device engaging one of said first pair of scissor arms;

a second pair of scissor arms each having upper and lower ends respectively coupled to each of said platform and said base, said second pair of scissor arms pivotably connected to each other intermediate their respective upper and lower ends about the first pivot axis;

a second shaft disposed along said first pivot axis, and having a third end and a fourth end spaced from said third end along said first pivot axis with said second pair of scissor arms pivotably disposed about said second shaft, and said third and fourth ends extending from said second pair of scissor arms with said fourth end terminating at a second shaft face;

a second retention device coupled to said third end of said second shaft with said second retention device engaging one of said second pair of scissor arms; and

a first brace fixed to another one of said first pair of scissor arms with said first brace abutting said first shaft face of said first shaft to maintain alignment of said first shaft along said first pivot axis for reducing wear between said first pivot axis and said first pair of scissor arms; and

a second brace fixed to another one of said second pair of scissor arms with said second brace abutting said second shaft face of said second shaft to maintain alignment of said second shaft along said first pivot axis for reducing wear between said first pivot axis and said second pair of scissor arms;

wherein said first brace has a first central portion and a first support portion extending from said first central portion toward said another one of said first pair of scissor arms to define a first gap between said first central portion and said another of said first pair of scissor arms with said first shaft face disposed in said first gap, and

wherein said second brace has a second central portion and a second support portion extending from said second central portion toward said another one of said second pair of scissor arms to define a second gap between said second central portion and said another of said second pair of scissor arms with said second shaft face disposed in said second gap.

2. The scissor-type lift assembly as set forth in claim **1** wherein;

said first brace has opposing distal ends and said first support portion is further defined as a pair of first support portions with one of said pair of first support portions extending from each of said distal ends of said first brace, and

said second brace has opposing distal ends and said second support portion is further defined as a pair of second support portions with one of said pair of second support portions extending from each of said distal ends of said second brace.

3. The scissor-type lift assembly as set forth in claim **2** further including;

a first plurality of fasteners extending through said pair of first support portions to secure said first brace to said another one of said first pair of scissor arms, and

a second plurality of fasteners extending through said pair of second support portions to secure said second brace to said another one of said second pair of scissor arms.

4. The scissor-type lift assembly as set forth in claim **1** wherein;

said first shaft defines a first groove about said first end with said first retention device disposed about said first shaft and aligned with said first groove, and

said second shaft defines a second groove about said third end with said second retention device disposed about said second shaft and aligned with said second groove.

5. The scissor-type lift assembly as set forth in claim **4** further including;

a first retention fastener extending through said first retention device and disposed in said first groove of said first shaft to secure said first retention device to said first shaft, and

a second retention fastener extending through said second retention device and disposed in said second groove of said second shaft to secure said second retention device to said second shaft.

6. The scissor-type lift assembly as set forth in claim **1** wherein;

said first shaft has a first removal feature defined in said second end for removing said first shaft from said first pair of scissor arms, and

said second shaft has a second removal feature defined in said fourth end for removing said second shaft from said second pair of scissor arms.

7. The scissor-type lift assembly as set forth in claim **1** further including;

a first spacer disposed about said first shaft between said first pair of scissor arms to space said first pair of scissor arms from each other along said first pivot axis, and

a second spacer disposed about said second shaft between said second pair of scissor arms to space said second pair of scissor arms from each other along said first pivot axis.

8. A scissor-type lift assembly comprising:

a base;

a platform coupled to said base for movement between elevated and lowered states in which said platform and said base are distant and proximate, respectively;

a first pair of scissor arms each having upper and lower ends respectively coupled to each of said platform and said base, said first pair of scissor arms pivotably connected to each other intermediate their respective upper and lower ends about a first pivot axis;

a first shaft disposed along said first pivot axis, and having a first end and a second end spaced from said first end along said first pivot axis with said first pair of scissor arms pivotably disposed about said first shaft, and said first and second ends extending from said first pair of scissor arms with said second end terminating at a first shaft face;

a first retention device coupled to said first end of said first shaft with said first retention device engaging one of said first pair of scissor arms;

a second pair of scissor arms each having upper and lower ends respectively coupled to each of said platform and said base, said second pair of scissor arms pivotably connected to each other intermediate their respective upper and lower ends about the first pivot axis;

a second shaft disposed along said first pivot axis, and having a third end and a fourth end spaced from said third end along said first pivot axis with said second pair of scissor arms pivotably disposed about said second shaft, and said third and fourth ends extending from said second pair of scissor arms with said fourth end terminating at a second shaft face;

a second retention device coupled to said third end of said second shaft with said second retention device engaging one of said second pair of scissor arms; and

a first brace fixed to another one of said first pair of scissor arms with said first brace abutting said first shaft face of said first shaft to maintain alignment of said first shaft along said first pivot axis for reducing wear between said first pivot axis and said first pair of scissor arms;

a second brace fixed to another one of said second pair of scissor arms with said second brace abutting said second shaft face of said second shaft to maintain alignment of said second shaft along said first pivot axis for reducing wear between said first pivot axis and said second pair of scissor arms;

a first flange coupled to said first shaft to further define said first shaft face and further maintain alignment of said first shaft along said first pivot axis for reducing wear between said first pivot axis and said first pair of scissor arms; and

a second flange coupled to said second shaft to further define said second shaft face and further maintain alignment of said second shaft along said first pivot axis for reducing wear between said first pivot axis and said second pair of scissor arms.

9. The scissor-type lift assembly as set forth in claim **8** wherein;

said first shaft has a first shaft periphery and said first flange has a first flange periphery with said first flange periphery disposed radially further from said first pivot axis than said first shaft periphery to further maintain alignment of said first shaft along said first pivot axis for reducing wear between said first pivot axis and said first pair of scissor arms, and

said second shaft has a second shaft periphery and said second flange has a second flange periphery with said second flange periphery disposed radially further from said first pivot axis than said second shaft periphery to further maintain alignment of said second shaft along said first pivot axis for reducing wear between said first pivot axis and said second pair of scissor arms.

10. The scissor-type lift assembly as set forth in claim **8** further including;

a first bushing disposed between said first flange and said another one of said first pair of scissor arms to reduce friction between said first flange and said another one of said first pair of scissor arms as said first pair of scissor arms pivots about said first pivot axis, and

a second bushing disposed between said second flange and said another one of said second pair of scissor arms to reduce friction between said second flange and said another one of said second pair of scissor arms as said second pair of scissor arms pivots about said first pivot axis.

11. The scissor-type lift assembly as set forth in claim **8** further including;

a first plate coupled to said first flange to further define said first shaft face and to further maintain alignment of said first shaft along said first pivot axis for reducing wear between said first pivot axis and said first pair of scissor arms, and

a second plate coupled to said second flange to further define said second shaft face and to further maintain alignment of said second shaft along said first pivot axis for reducing wear between said first pivot axis and said second pair of scissor arms.

12. The scissor-type lift assembly as set forth in claim **8** wherein;

said first shaft defines a first groove about said first end with said first retention device disposed about said first shaft and aligned with said first groove, and

said second shaft defines a second groove about said third end with said second retention device disposed about said second shaft and aligned with said second groove.

13. The scissor-type lift assembly as set forth in claim **12** further including;

a first retention fastener extending through said first retention device and disposed in said first groove of said first shaft to secure said first retention device to said first shaft, and

a second retention fastener extending through said second retention device and disposed in said second groove of said second shaft to secure said second retention device to said second shaft.

14. The scissor-type lift assembly as set forth in claim **8** wherein;

said first shaft has a first removal feature defined in said second end for removing said first shaft from said first pair of scissor arms, and

said second shaft has a second removal feature defined in said fourth end for removing said second shaft from said second pair of scissor arms.

15. The scissor-type lift assembly as set forth in claim **8** further including;

a first spacer disposed about said first shaft between said first pair of scissor arms to space said first pair of scissor arms from each other along said first pivot axis, and

a second spacer disposed about said second shaft between said second pair of scissor arms to space said second pair of scissor arms from each other along said first pivot axis.

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